

WATER QUALITY MEMORANDUM

Utah Coal Regulatory Program

January 30, 2008

TO: Internal File

THRU: Pamela Grubaugh-Littig, Permit Supervisor

FROM: Dana Dean, P.E., Senior Reclamation Hydrologist

RE: 2007 Second Quarter Water Monitoring, Canyon Fuel Company, LLC,
Skyline Mine, C/007/0005-WQ07-2, Task ID #2639

The Skyline Mine is an operating longwall mine. Current operations are in the North Lease area of the mine. Many mined-out areas of the mine have been sealed-off. Water monitoring requirements can be found in Section 2, especially pages 2-36, 2-36a, 2-36b, 2-37, 2-37a, and 2-39aa of the MRP.

There are 42 stream sampling sites in the North Lease where the Permittee will measure flow on a monthly basis for 12 months prior to, during and 12 months after longwall mining below each site. The Division will check this monitoring in conjunction with the Annual Report.

1. Was data submitted for all of the MRP required sites? YES ☒ NO ☐

Springs

The MRP requires spring sampling at 25 springs (S10-1, S12-1, S13-2, S13-7, S14-4, S15-3, S17-2, S22-5, S22-11, S23-4, S24-1, S24-12, S26-13, S34-12, S35-8, S36-12, 2-413, 3-290, 8-253, WQ1-39, WQ3-6, WQ3-26, WQ3-41, WQ3-43, and WQ4-12).

The Permittee submitted all required samples for the spring sites.

Streams

The MRP requires stream sampling at 36 stream-sites (CS-3, CS-4, CS-6, CS-7, CS-8, CS-9, CS-10, CS-11, CS-12, CS-13, CS-14, CS-16, CS-17, CS-18, CS-19, CS-20, CS-21, CS-22, CS-23, MD-1, SRD-1, F-9, F-10, UP&L-10, VC-6, VC-9, VC-10, VC-11, VC-12, WRDS-1, WRDS-2, WRDS-3, WRDS-4, EL-1, and EL-2).

The Permittee submitted all required samples for the stream sites.

Wells

The MRP requires spring sampling at 18 wells (JC-1, JC-3, ELD-1, W79-10-1-B, W79-14-2A, W79-26-1, W79-35-1A, W79-35-1B, W2-1, W20-4-1, W20-4-2, W99-4-1, W99-21-1, W99-28-1, W20-28-1, 91-26-1, W91-35-1, and 92-91-03).

The Permittee submitted all required samples for the well sites.

UPDES

The UPDES Permit/MRP require **weekly** monitoring of 3 outfalls: 001, Sedimentation Pond Discharge to Eccles Creek at the Portal; 002, Sedimentation Pond Discharge to Eccles Creek at the Loadout; and 003, the Sedimentation Discharge at the Waste Rock Disposal Site. Well JC-3 is permitted as a UPDES point, but PacifiCorp is the Permittee, and JC-3 has not discharged since July of 2004.

The Permittee submitted all required samples for the UPDES sites. Only outfall 001 reported flow.

2. Were all required parameters reported for each site? YES ☐ NO ☒

Oxygen 18 and deuterium were not reported at JC-1. The laboratory that provides the age dating data quite often takes a long time to report the data back to the Permittee. The Permittee has always been quite prompt at getting the data to the Division as soon as they receive it from the lab.

3. Were any irregularities found in the data? YES ☒ NO ☐

Several parameters fell outside of two standard deviations from the mean encountered at the respective sites. They were:

Site	Parameter	Value	Standard Deviation s from Mean	Mean
CS-3	Cation/Anion Balance	3.6%	2.39	1.19%
CS-3	Chloride	60 mg/L	2.76	14.61 mg/L
CS-9	Bicarbonate as CaCO ₃	226 mg/L	2.36	243.60 mg/L
CS-13	Cation/Anion Balance	4.6%	4.11	0.56%
CS-21	Temperature	20 °C	2.61	7.50 °C
CS-21	Total Dissolved Solids	201 mg/L	2.53	260.88 mg/L
F-9	Flow	370 gpm	2.66	98.88 gpm
F-10	Cation/Anion Balance	4.1%	2.45	0.94 %
F-10	Specific Conductivity	461 µmhos/cm	2.56	382.23 µmhos/cm
VC-9	Cation/Anion Balance	3.4%	3.10	0.96%
VC-10	Temperature	17 °C	2.33	5.71 °C
S10-1	Cation/Anion Balance	6.4%	2.79	1.93%

S17-2	pH	7.89	2.08	7.19
S22-5	Specific Conductivity	880 μ mhos/cm	2.81	516.86 μ mhos/cm
3-290	Temperature	17 °C	2.81	9.26 °C
WQ3-26	Cation/Anion Balance	6.1%	2.44	1.27%
WQ3-41	Temperature	13.5 °C	4.26	7.94 °C
WQ3-43	Total Suspended Solids	95 mg/L	3.37	28.54 mg/L
WQ4-12	Temperature	9.6 °C	2.23	693 °C

There is no trend in the bicarbonate as CaCO_3 at CS-9 ($R^2 = 0.0275$). There are only six samples in the population and this, the lowest concentration is just 24 mg/L less than the highest recorded.

The cation/anion balance at CS-3, CS-13, F-10, and VC-9 is not of concern, since it is within the expected range ($<5\%$) at each site. The balance at S10-1 and WQ3-26 is outside two standard deviations, and above the 5% attention value. It is not clear why it is high, but as discussed below, it is something that the Permittee should be able to explain.

There is a fairly strong upward trend in chloride at CS-3 ($R^2 = 0.6794$), but levels are well below any water quality standards, and this quarter's concentration is lower than last quarter's.

The flow at F-9 remains above average, though it has gone down since last quarter. The flow tracks well with the Palmer Hydrologic Drought Index, and the Surface Water Supply Index, indicating that the fluctuations are due to changes in climate and precipitation.

The pH at S17-2 is not of concern, since it is within expected limits.

There is a very weak upward trend in the specific conductivity at F-10 ($R^2 = 0.1735$), and a strong upward trend in the specific conductivity at S22-5 ($R^2 = 0.851$). There is no standard for specific conductivity, but it is closely related to total dissolved solids (TDS). The TDS at each of these sites is within the expected range.

There is no trend in the total dissolved solids at CS-21. There are only 13 samples in the population, and the range is just over 100 mg/L. CS-21 is in an area that has not been undermined.

There is no trend in the TSS at WQ3-43 ($R^2 = 0.0005$). Total suspended solids readings at springs can be influenced by many factors, and WQ3-43 is in an area that has not yet been undermined.

Several routine Reliability Checks were outside of standard values. They were:

Site	Reliability Check	Value Should Be...	Value is...
CS-3	Na/(Na + Cl)	$> 50\%$	20%
CS-4	TDS/Conductivity	$>0.55 \text{ \& } <0.75$	0.54

CS-4	Conductivity/Cations	>90 & < 110	83
CS-4	Na/(Na + Cl)	> 50%	49%
CS-6	Mg/(Ca + Mg)	< 40 %	54%
CS-6	Ca/ (Ca + SO4)	> 50 %	47%
CS-9	Conductivity/Cations	>90 & < 110	85
CS-11	Conductivity/Cations	>90 & < 110	85
CS-11	Na/(Na + Cl)	> 50%	46%
CS-12	Conductivity/Cations	>90 & < 110	80
CS-12	Mg/(Ca + Mg)	< 40 %	53%
CS-12	Ca/ (Ca + SO4)	> 50 %	36%
CS-13	Conductivity/Cations	>90 & < 110	86
CS-13	Na/(Na + Cl)	> 50%	49%
CS-14	Conductivity/Cations	>90 & < 110	85
CS-14	Mg/(Ca + Mg)	< 40 %	47%
CS-19	TDS/Conductivity	>0.55 & <0.75	0.53
CS-19	Conductivity/Cations	>90 & < 110	88
CS-20	Conductivity/Cations	>90 & < 110	90
CS-21	Conductivity/Cations	>90 & < 110	88
CS-21	K/(Na + K)	< 20%	21%
F-10 Jun 29	TDS/Conductivity	>0.55 & <0.75	0.46
UPL-10	TDS/Conductivity	>0.55 & <0.75	0.50
UPL-10	Na/(Na + Cl)	> 50%	37%
VC-6	Conductivity/Cations	>90 & < 110	86
VC-6	Mg/(Ca + Mg)	< 40 %	51%
VC-6	Ca/ (Ca + SO4)	> 50 %	48%
VC-9	Mg/(Ca + Mg)	< 40 %	55%
VC-9	Ca/ (Ca + SO4)	> 50 %	47%
S10-1	Cation/Anion Balance	<5%	5.9
S10-1	TDS/Conductivity	>0.55 & <0.75	0.84
S10-1	Conductivity/Cations	>90 & < 110	89
S10-1	Na/(Na + Cl)	> 50%	39%
S12-1	Cation/Anion Balance	<5%	5.6
S12-1	Conductivity/Cations	>90 & < 110	84
S13-7	Conductivity/Cations	>90 & < 110	85
S17-2	Conductivity/Cations	>90 & < 110	86
S17-2	Na/(Na + Cl)	> 50%	43%
WQ3-26	Conductivity/Cations	>90 & < 110	139
WQ3-26	K/(Na + K)	< 20%	22%
92-91-03	Conductivity/Cations	>90 & < 110	83
92-91-03	K/(Na + K)	< 20%	21%
Outfall 001 Jun 2	TDS/Conductivity	>0.55 & <0.75	0.84

These inconsistencies do not necessarily mean that a sample is wrong, but it does indicate that something is unusual. An analysis and explanation of the inconsistencies by the

Permittee would help to increase the Division's confidence in the samples. The Permittee should work with the lab to make sure that samples pass all quality checks so that the reliability of the samples does not come into question. The Permittee can learn more about these reliability checks and some of the geological and other factors that could influence them by reading Chapter 4 of *Water Quality Data: Analysis and Interpretation* by Arthur W. Hounslow. A geological influence is most likely here, since most samples have the same inconsistencies, and they recur each quarter.

The Utah Division of Water Quality (DWQ) issued the current UPDES permit on Nov. 23, 2004. It allows for a daily maximum of total dissolved solids discharged (TDS) of 1310 mg/l and a 30-day average of 500 mg/l. There is no tons per day (tpd) daily maximum, unless the 30-day average exceeds 500 mg/l; then a 7.1-tpd limit is imposed. The permit also states:

Upon determination by the Executive Secretary that the permittee is not able to meet the 500 mg/L 30-day average or the 7.1 tons per day loading limit, the permittee is required to participate in and/or fund a salinity offset project to include TDS offset credits, within six (6) months of the effective date of this permit.

The Division of Water Quality approved a Salinity Offset Plan for the Skyline Mine on January 5, 2005. A copy of the agreement can be found in the Division's Incoming files, and at:

<https://fs.ogm.utah.gov/FILES/COAL/PERMITS/007/C0070005/2005/INCOMING/0006.pdf>.

For the fourth quarter of 2006, the Permittee has not exceeded the daily max of 1310 mg/L for TDS. However, at Outfall 001 the 30-day average has remained above 500 mg/l and the tons per day are much greater than 7.1. Because of these exceedences, Canyon Fuel Company continues to participate in the salinity-offset program.

4. On what date does the MRP require a five-year re-sampling of baseline water data.

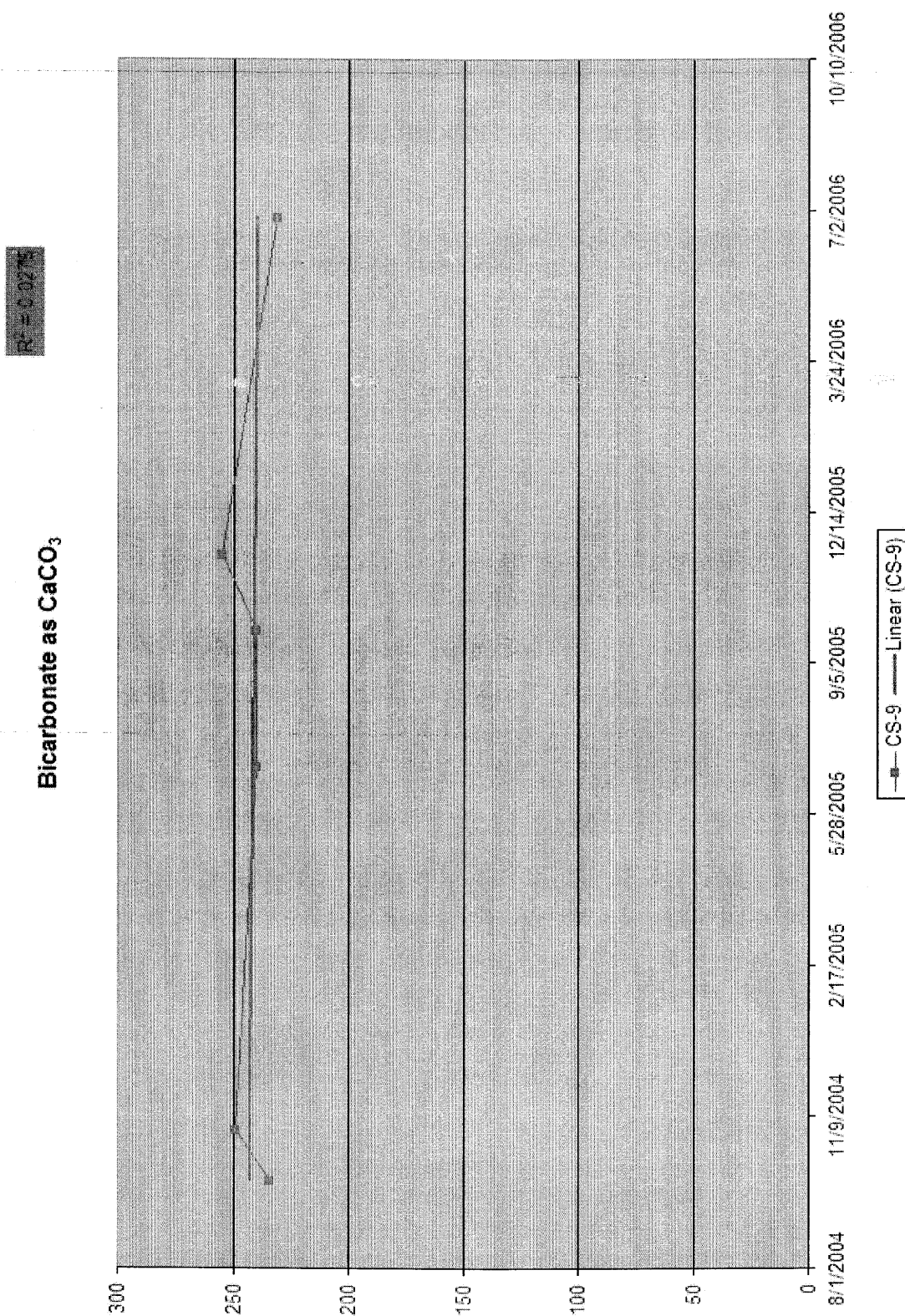
There is no commitment in the MRP to resample for baseline parameters. However, they are required to monitor 8 stream sites (CS-1, CS-7, CS-8, CS-10, CS-16, CS-17, CS-18, and VC-10) and 13 springs (S13-2, S14-4, S15-3, S22-5, S22-11, S23-4, S24-12, S26-13, S34-12, S35-8, S36-12, 2-413, and 3-290) for all operational parameters at high and low flow (where accessible) once every five years (2010, 2015, etc.), and whenever abrupt changes in flow occur.

5. Based on your review, what further actions, if any, do you recommend?

No further actions are necessary at this time.

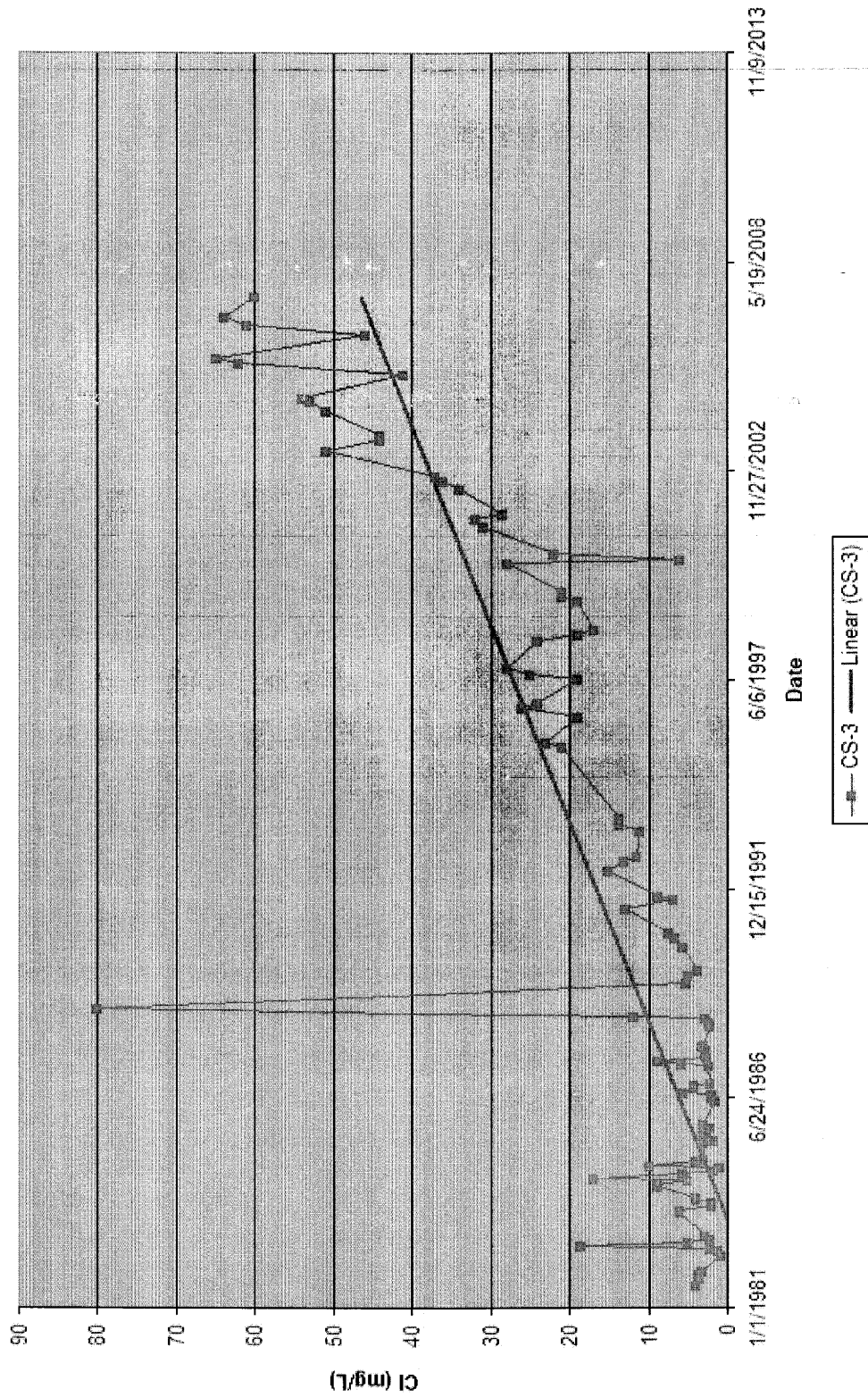
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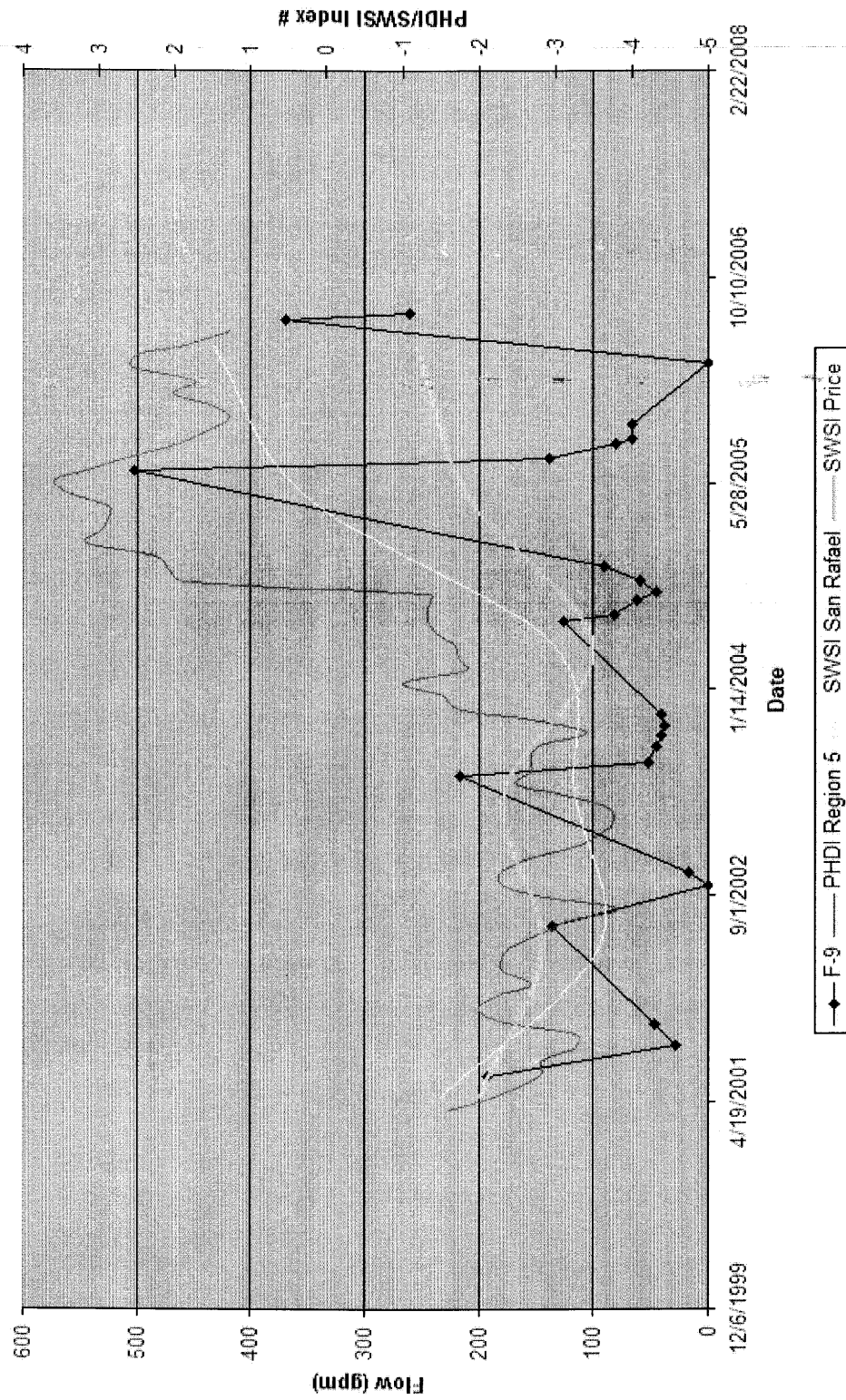


$R^2 = 0.6794$

Chloride



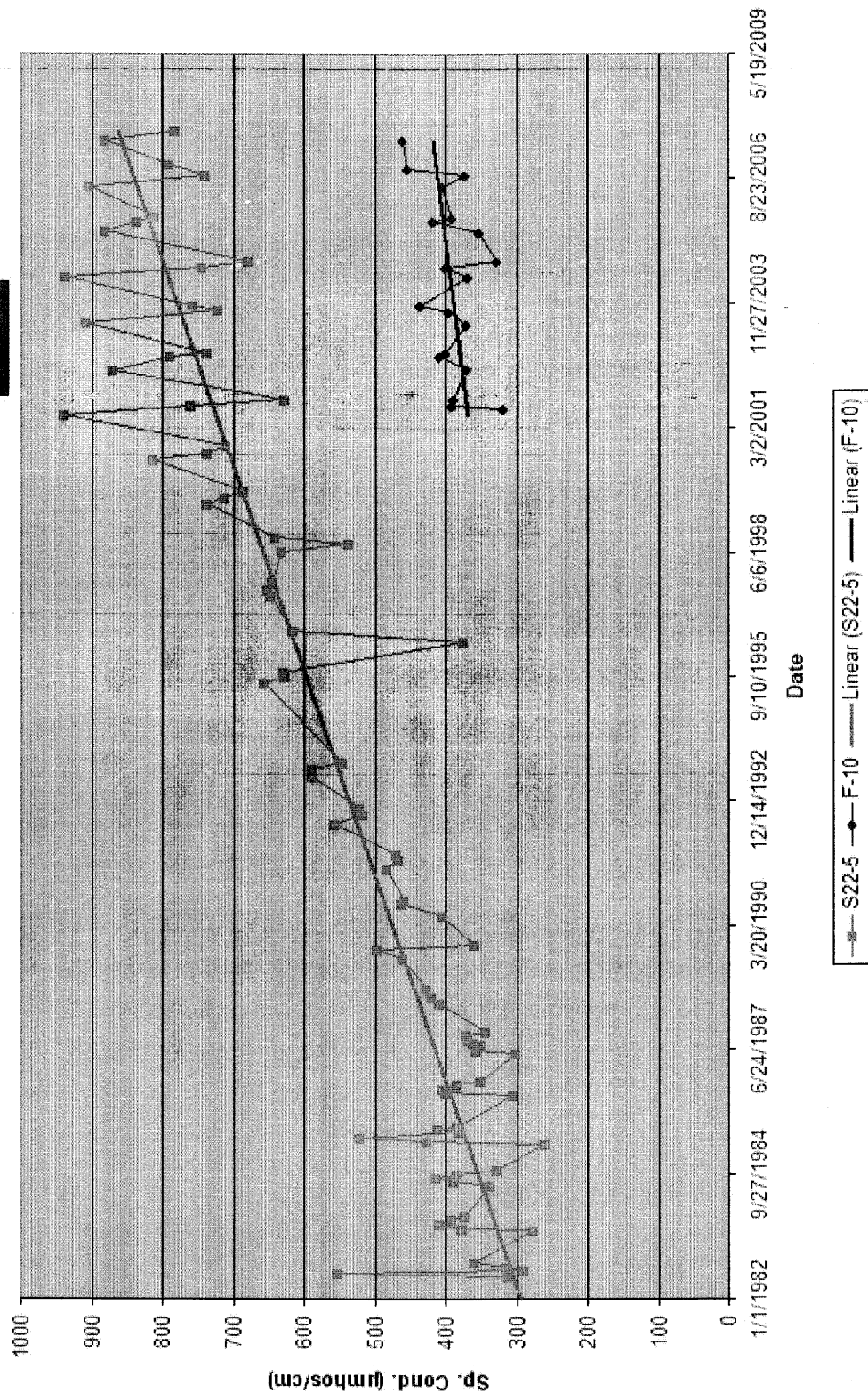
Flow vs. Palmer Hydrologic Drought Index and Surface Water Supply Index
F-9

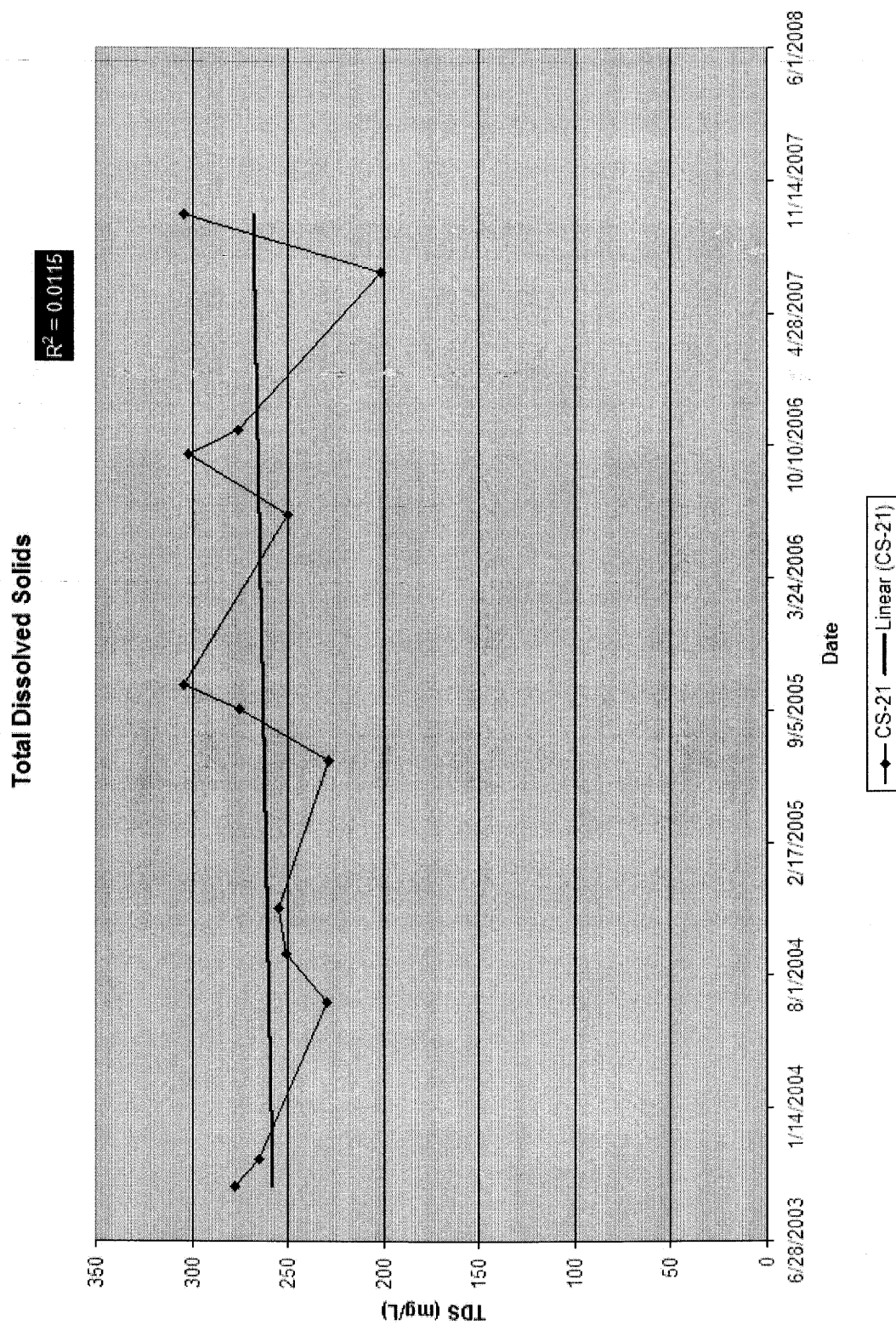


Specific Conductivity

$R^2 = 0.851$

$R^2 = 0.1735$





$R^2 = 0.0005$

Total Suspended Solids

